TABLE 1. Acute renal failure risk

Factor	Regression coefficient	Odds ratio (95% CI)	P value
Constant	-4.16		
Angiography on the operation day	0.702	2.02 (1.07–3.8)	.030
Age (y)	0.047	1.05 (1.02–1.08)	.001
Ejection fraction (%)	-0.040	0.96 (0.94–0.98)	.001
CPB duration (min)	0.016	1.016 (1.01–1.02)	.001
High contrast dose	0.592	1.81 (1.01–3.23)	.045

CI, Confidence interval; CPB, cardiopulmonary bypass.

nephropathy peaks 3 to 5 days after contrast administration, in the usual “noncardiac surgical” clinical model. However, we must consider that the cardiac operation may introduce important changes, with the widely known detrimental effect of cardiopulmonary bypass, hemodilution, loss of pulsatility, and possible low cardiac output state on renal function. All these factors may certainly change the time-related onset of a contrast-induced nephropathy, and it is surprising that cardiopulmonary bypass time is not an independent risk factor for ARF in the authors’ model.

Nevertheless, we believe that this study offers an important clinical message, highlighting the deleterious renal effects of a high contrast dose and a short interval of time between the angiogram and the coronary operation.

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Reply to the Editor:

It is with pleasure that I respond to Ranucci and Ballotta regarding the article “The Effect of Cardiac Angiography Timing, Contrast Media Dose, and Preoperative Renal Function on Acute Renal Failure After Coronary Artery Bypass Grafting.”¹ Indeed, the studies of Ranucci,² Del Duca,³ and their associates served in part as the trigger for our study. In their original article, Ranucci and associates² identified operation done on same day as the angiogram to be an independent risk factor for acute renal failure (ARF). However, contrast dose greater than 1.36 mL/kg did not turn out to be an independent risk factor. The prevalence of ARF in their series was 5.7% (based on ARF definition of peak creatinine twice the baseline value and >2 mg/dL). In our study,¹ ARF was present in 13.6% (based on ARF definition of 25% decrease of estimated creatinine clearance and creatinine clearance [eCrCl] of 60 mL/min or less on day 3), and both contrast dose greater than 1.4 mL/kg, and operation up to 5 days after angiography turned out to be independently associated with ARF. Ranucci and Ballotta hypothesized that the differences are secondary to different ARF definitions, and they reanalyzed their data with a more liberal definition of ARF and higher contrast dose. Now, con-

trast dose turned out to be an independent predictor of ARF, but operation performed later than the same day as the angiogram failed to show any independent association with ARF. Inasmuch as the definition of ARF is not standardized, I agree that it is difficult to compare different studies with different definitions. Warnock,⁴ in a recent editorial, challenges the subject and call for standardization. Ranucci and Ballotta are to be congratulated for reanalyzing their data with ARF definition close to the one my colleagues and I used (although not similar, inasmuch as we used eCrCl and they used creatinine for definition). Differences in definition remain an issue, although I believe other factors may influence the differences between the results. As we discussed in our manuscript, we studied isolated first time coronary artery bypass grafting only, in contrast to Ranucci and associates,² who included several types of operations in their study, including reoperations, valve surgery, and other operations that were already identified elsewhere as risk factors for development of ARF. Some of those more complex operations are associated with multiple comorbidities and end up usually with longer cardiopulmonary bypass time that may be a marker of complexity. This may explain why we did not identify cardiopulmonary bypass as a predictor of ARF. Those more complex cases and other cases in which ARF developed as part of a broader multiorgan failure (sepsis, low cardiac output, and others) are not directly related to time after angiography but are captured as such owing to the use of peak creatinine as the reference point for ARF definition. We elected to use creatinine on postoperative day 3 as the reference point to try to minimize capturing ARF not related directly to timing of angiography. It is also of interest that in the Ranucci study, diabetes and preoperative renal failure were not associated with postoperative ARF (both variables are strongly associated with

ARF in many studies). Again, it can be secondary to definition of renal failure (creatinine vs eCICr and absolute values), but it is more likely due to the relatively small heterogeneous group of patients studied.

Overall, I agree with Ranucci and Ballotta's conclusion. The importance of both studies is the demonstration of the deleterious relationship between high contrast dose and proximity to operation.

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3. Del Duca D, Iqbal S, Rahme E, Goldberg P, De Varennes B. Renal failure after cardiac surgery: timing of cardiac catheterization and other perioperative risk factors. *Ann Thorac Surg.* 2007;84:1264-71.
4. Warnock DG. Acute kidney injury: where's the consensus about its definition? *Nephrol Dial Transplant.* 2010;25:9.

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Notice of Correction

Re: McNamara PJ, Stewart L, Shivananda SP, Stephens D, Sehgal A. Patent ductus arteriosus ligation is associated with impaired left ventricular systolic performance in premature infants weighing less than 1000 g. *J Thorac Cardiovasc Surg.* 2010;140:150-7.

In the above-noted article, Figure 1 and Figure 2 were not printed in the correct order. The correct figures and legends are reprinted below.

FIGURE 1. Trends in mean velocity of circumferential fiber shortening (mVCFc) after patent ductus arteriosus ligation. # $P < .05$ versus baseline, analysis of variance.

FIGURE 2. Trends in left ventricular (LV) exposed vascular resistance after patent ductus arteriosus ligation. # $P < .05$ versus baseline, analysis of variance.